IOWA HIGHWAY RESEARCH BOARD (IHRB)

Minutes of June 28, 2013

Regular Board Members Present

A. Abu-Hawash	R. Kieffer
W. Weiss	E. Steffensmeier
T. Wipf	K. Mayberry
R. Younie	R. Knoche
P. Assman	S. Okerlund
D. Miller	

Alternate Board Members Present

P. Mouw	D. Sprengeler

Members with No Representation

V. Dumdei	D. Schnoebelen
K. Jones	R. Fangmann

Secretary - M. Dunn

Visitors

Vanessa Goetz	Iowa Department of Transportation
Linda Narigon	Iowa Department of Transportation
Donna Buchwald	Iowa Department of Transportation
Thanos Papanicolaou	University of Iowa
Iordanis Moustakidis	University of Iowa
Keith Knapp	Iowa LTAP/In Trans
Brent Phares	Iowa State University/In Trans
David White	Iowa State University/In Trans
Jeramy Ashlock	Iowa State University/In Trans

The meeting was held at the Iowa Department of Transportation Ames Complex, Materials East/West Conference Room, on Friday, June 28, 2013. The meeting was called to order at 9:00 a.m. by Chairperson Ahmad Abu-Hawash with an initial number of 11 voting members/alternates at the table.

Minutes

Motion to approve Minutes from the May 31, 2013 meeting

Motion to Approve by 1st R. Younie 2nd T. Wipf
Motion carried with 11 Aye, 0 Nay, 0 Abstaining.

PROPOSAL, “Low Cost Rural surface Alternatives: Phase II Demonstration Project”, Jeremy Ashlock, ISU/In Trans, ($121,974)

BACKGROUND

Moisture from precipitation and freeze/thaw cycles combined with inadequate drainage leads to saturated conditions which can damage unbound roads, and in severe cases, make them impassable. Intersections and bridge approaches are common trouble locations, but damage due to frost heave and boils can occur throughout a given roadway depending on variations in drainage, construction quality, and traffic loading. Some approaches currently used by County Engineers to deal with frost boils include temporarily spreading rock on the affected areas, lowering or improving drainage ditches, tiling, bridging the area with stone and geosynthetic covered by a top course of aggregate or gravel, coring boreholes and filling them with calcium chloride to melt lenses and provide drainage, and re-grading the crown to a slope of 4 to 6% to maximize spring drainage. However, most of these maintenance solutions are aimed at dealing with frost boils after they occur.

To prevent or minimize the occurrence of such freeze/thaw damage related problems in the first place the proposed research project will examine a range of construction methods for building and treating granular surfaced roadways. A selection of the most promising technologies identified in the previous IHRB study “Low Cost Rural Surface Alternatives (IHRB 10-05)” will be examined in consultation with the project technical advisory committee (TAC) and used on a demonstration project on a two-mile stretch of low volume road in Hamilton County, IA. Construction will be documented and in-service performance of the test sections will be monitored before, during, and after spring thaw.

OBJECTIVES

The proposed demonstration project will implement and monitor a selected set of these technologies over a two-mile section of Vail Avenue from Highway 175 to 310th street in Hamilton County, IA. This section of roadway currently requires constant, year-round maintenance with four grader passes per week. The road needs to be reshaped, but the County Engineer prefers to avoid incorporating ditch material back onto the roadway. This is because the ditch material typically contains a significant percentage of fines washed from the adjacent fields. Agricultural operations are sterilizing the soil in the adjacent fields, which is preventing grass from growing, resulting in water carrying silt to the ditches. As a result, the County Engineer is having difficulty keeping up with ditch cleaning given the high erosion rate. This section of roadway is therefore a good candidate for testing the various construction procedures and treatments for stabilization.

The objectives of the proposed research project are to:

> (a) Perform field testing of a range of granular surface stabilization technologies on a two-mile long demonstration project in Hamilton County, Iowa.
>
> (b) Measure and document the performance of the demonstration roadway sections before, during, and after a seasonal freeze/thaw cycle.

(c) Assess the initial cost, relative performance, maintenance requirements, and long term life-cycle costs of the different stabilization techniques.

(d) Identify the most effective and most economical alternatives for minimizing or eliminating frost heave/boil issues before they occur.

DISCUSSION

Q. Having 20 different test sections would they be 100 feet long?
A. There will be a total of 5 test sections that will be placed 2 miles in Hamilton County.

Q. Are we using some positive ideas from the Boone site?
A. What has been learned from the Boone site will be used at different test sections.

Q Are you doing analysis of the soil?
A. We will be collecting data on the general geometry of the project, the ground water and infiltration.

Motion to Approve by 1st E. Steffensmeier, 2nd K. Mayberry.
Motion carried with 11 Aye, 0 Nay, 0 Abstaining.

PROPOSAL, Additional Funding Request for TR-617, Adaptive Field Detection Method for Bridge Scour Monitoring Using Motion-Sensing Radio Transponders (RFIDs), Thanos Papanicolaou, University of Iowa, ($40,947)

BACKGROUND
The project builds on research funded by IDOT and more specifically on knowledge gained in project TR-617 "*An Adaptive Field Detection Method For Bridge Scour Monitoring Using Motion-Sensing Radio Transponders (RFIDs)*" by Papanicolaou et al. (2010).

The key outcomes from project TR-617 are:

1. We have performed the assemblage of custom made, optimized for max read range antennas capable of providing detection ranges up to 60 ft (~20 m) within the water–sediment column (Figure 1).
2. We have designed and assembled powerful passive transponders with a unit of Texas Instruments for detection ranges up to 60 ft (~20 m) (Figure 2).
3. We have developed a method for inserting the "smart" Leopold chain below the sediment bed along with the transponders mounted on the chain by using vibracoring (Figure 3).
4. We have developed and further enhanced the features of a computer code in LabView to enable simultaneous, multiple readouts of smart particles under different flow conditions and sediment properties. The code provides the ID of smart particles, the x,y,z of the smart particles, and the instance of their detection in a user-friendly windows interface (Figure 4).

The present project extension builds on these outcomes and aims to complete the Radio Frequency Identification (RFID) system as a product for bridge infrastructure monitoring, while improving its functionality and its user friendly character.

OBJECTIVES

We have identified 3 main tasks for completing the operational performance of the developed RFID system. These tasks are as follows:

Task 1: Improve the waterproofing of the new developed transponders and explore ways to reduce the transponder external plastic encasing diameter, in order to facilitate the deployment of the transponders within a river bed.

Task 2: Incorporate a Micro Electro Mechanical Sensor (MEMS) inclinometer to the transponders to enhance the “folding chain” method for bridge scour depth estimation. The inclinometer will uniquely identify the moment when the tag ceases to be perpendicular to the excitation antenna due to folding triggered by the scour action. In addition the MEMS inclinometer will complement the “signal strength” or return signal strength indicator (RSSI) method

Task 3: Incorporate the magnetic and dielectric properties of the river bed material (clay, sand, gravel, or mixtures of these) as well as the excitation antenna electromagnetic characteristics into RFID software

Benefits
This project will provide real-time datasets that can be used in making decisions on bridge down time, repair cost, and functionality. These datasets could aid to the fundamental understanding of clear water scour and live bed scour. Finally, the research will pave the way for inexpensive, bridge automated monitoring and provide the Iowa DOT with an open framework to expedite the development of similar systems for other critical infrastructure such as dams, and levees or other near shore structures.

DISCUSSION

Q. Have we seen the final report with the chained transponders?
A. Yes, a previous phase discussed the folding chain approach.

Q. If scours occur will you go back a month later?
A. There is no need to go back in because the position will be accounted.

Motion to Approve by 1st W. Weiss, 2nd E. Steffensmeier.
Motion carried with 11 Aye, 0 Nay, 0 Abstaining.

PROPOSAL, "Short Span Prefabricated Bridge County Standards", Mark Dunn, Iowa DOT, ($46,164)

BACKGROUND

With approximately 20,700 bridges in Iowa that fall under local jurisdiction, a need has been identified to develop a set of standards for a single span prefabricated bridge system. The intent of developing these prefabricated bridge standards is to provide a bridge system that has the potential to improve bridge construction, accelerate project delivery, improve worker safety, be cost effective, reduce impacts to the traveling public by reducing traffic disruptions and duration of detours, and allow local forces to construct the bridges.

The development of the standards would be divided into three phases. Phase 1 would develop the concept as well as initial details to be tested in a laboratory environment. Phase 2 would involve an advisory role for laboratory testing of the details identified in Phase 1, and Phase 3 would focus on final design and development of the standards.

The prefabricated bridge components will be based on the following:

- 24'-0" and 30'-0" roadway widths
- Skews of 0°, 15° and 30°
- Span lengths of 30'-0",40'-0", 50'-0" 60'-0" and 70'-0". The spans would utilize precast concrete beams, possibly with prestressing utilized only in the span lengths which require it.
- Voided box beams would be considered as a viable structural system
- Consider the weight of precast elements due to concerns with moving and placing beams when
weights exceed 45,000 lbs.
- Beams could be joined transversely with threaded rods
- Abutment concepts may include precast as well as an option for cast-in-place abutments with
pile foundations.

OBJECTIVES

The Phase 1 effort would involve researching short span prefabricated bridge components, developing a preferred concept for the superstructure and abutments, developing working sketches of proposed components, refining those concepts, and identifying elements or details to be tested. Research of the prefabricated components will begin by assembling information already developed and accumulated by Iowa DOT as well as researching prefabricated components developed by other agencies. From this information, HDR will develop or short list concepts and details for further refinement. It is assumed that one meeting would be held in Ames with two staff members from HDR attending to discuss concepts and refinements to concepts. Additional considerations are given in the guidance provided by Iowa DOT and included in Appendix A. Appendix A is included as a reference for bridge constraints and items of consideration since it is written more specific to a concrete box superstructure. Although a concrete box superstructure has been identified as a viable alternative, other structure types will be considered in Phase I prior to refinement of the structure type.

Phase 2 Work - It is assumed that system testing would be performed by Iowa State University. HDR would serve in a limited advisory role to provide input on the testing program and review the *results.* Results of the testing would be used in development of the final details. It is assumed the testing may include tests to demonstrate constructability of the proposed system, as well as some structural details such as the configuration of the grout key between precast superstructure components, the transverse tie between superstructure components and accelerated corrosion testing of the ends of precast beam units. Assume a nominal level of consultation regarding the testing and one visit by two staff members during some phase of the testing.

Motion to Approve by 1st P. Assman, 2nd K. Mayberry.
Motion carried with 11 Aye, 0 Nay, 0 Abstaining.

NEW BUSINESS

HR-296, Local Technical Assistance Program (LTAP) Adjustments for 2013:
DOT local systems have found alternative funding for the NHI bridge program training. FHWA has also provided an extra $10k that will also be available for LTAP initiatives. Due to the additional funding and a couple of position openings within LTAP, there will be some additional capabilities within LTAP in the coming months.

RFP-IHRB-14-03 Increasing the Stability of Unbound Shoulder Materials:
Following further discussions with technical staff at the Iowa DOT, it was determined that recent changes in shoulder design and construction has significantly improved the performance of shoulders that had led to this problem statement. It was recommended that this project be withdrawn from consideration and to move on to other projects from the priority list.

Vanessa Goetz gave a summary on her meeting with the Minnesota research board. She shared our Iowa Research Board process. Minnesota would like to continue to keep communication between the State Research boards.

ADJOURN

Motion to Approve by 1st E. Steffensmeier, 2nd K. Mayberry.
Motion carried with 11 Aye, 0 Nay, 0 Abstaining.

The next meeting of the Iowa Highway Research Board will be held Friday, July 26, 2013, in the East/West Materials Conference Room at the Iowa DOT. The meeting will begin promptly at 9 a.m.

Mark J. Dunn

Mark J. Dunn, IHRB Secretary